

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 53-29847	FOR FURTHER ACTION <div style="text-align: right; font-size: small;">see Form PCT/ISA/220 as well as, where applicable, item 5 below.</div>	
International application No. PCT/US2009/053551	International filing date (<i>day/month/year</i>) 12 AUGUST 2009 (12.08.2009)	(Earliest) Priority Date (<i>day/month/year</i>) 12 AUGUST 2008 (12.08.2008)
Applicant MICROSTAQ, INC. et al		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 6 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (See Box No. II)

3. ☐ Unity of invention is lacking (See Box No. III)

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the drawings to be published with the abstract is Figure No. 1
- ☐ as suggested by the applicant.
- ☒ as selected by this Authority, because the applicant failed to suggest a figure.
- ☐ as selected by this Authority, because this figure better characterizes the invention.
- b. ☐ none of the figure is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/053551**A. CLASSIFICATION OF SUBJECT MATTER****B81B 3/00(2006.01)i, B81B 7/02(2006.01)i, F16K 31/02(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B81B 3/00; B01L 3/02; E03B 7/07; F15B 13/044; F15C 1/20; F16K 31/02; G01N 1/10; G01N 30/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

(Chinese Patents and application for patent)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: "microvalve", "pressure", "cavity", "port", "slide", "conduit", "fluid" and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005-0121090 A1 (Harry A. Hunnicutt) 09 JUNE 2005 See abstract; figures 1A-16B; claims 22-32.	1-21
A	US 2002-0029814 A1 (Marc Unger et al.) 14 MARCH 2002 See abstract; figures 1-30; claims 1-39.	1-21
A	US 6123316 A (David K. Biegelsen et al.) 26 SEPTEMBER 2000 See abstract; figures 1-13; claims 1-5.	1-21
A	US 2002-0014106 A1 (Ravi Srinivasan et al.) 07 FEBRUARY 2002 See abstract; figures 1A-11B; claims 1-32.	1-21
A	US 2003-0206832 A1 (Pierre Thiebaud et al.) 06 NOVEMBER 2003 See abstract; figures 1-3; claims 1-30.	1-21
A	US 2005-0205136 A1 (Alex R. Freeman) 22 SEPTEMBER 2005 See abstract; figures 1-9E; claims 1-20.	1-21

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

19 MARCH 2010 (19.03.2010)

Date of mailing of the international search report

05 APRIL 2010 (05.04.2010)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-
gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM, MYOUNG CHAN

Telephone No. 82-42-481-5499



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/053551

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/053551

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US2009/053551

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2003-0206832 A1	06.11.2003	None	
US 2005-0205136 A1	22.09.2005	US 7264617 B2	04.09.2007

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

INKS ALLEN W

MACMILLAN, SOBANSKI & TODD, LLC ONE
MARITIME PLAZA; 5TH FLOOR 720 WATER STREET
TOLEDO OH 43604 USA

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing

(day/month/year) 05 APRIL 2010 (05.04.2010)

Applicant's or agent's file reference

53-29847

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2009/053551

International filing date (day/month/year)

12 AUGUST 2009 (12.08.2009)

Priority date(day/month/year)

12 AUGUST 2008 (12.08.2008)

International Patent Classification (IPC) or both national classification and IPC

B81B 3/00(2006.01)i, B81B 7/02(2006.01)i, F16K 31/02(2006.01)i

Applicant

MICROSTAQ, INC. et al

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
Government Complex-Daejeon, 139
Seonsa-ro, Seo-gu, Daejeon 302
-701, Republic of Korea
Facsimile No. 82-42-472-7140

Date of completion of this opinion

19 MARCH 2010 (19.03.2010)

Authorized officer

KIM, MYOUNG CHAN

Telephone No.82-42-481-5499



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2009/053551

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of:

a. a sequence listing filed or furnished

- ☐ on paper
- ☐ in electronic form

b. time of filing or furnishing

- ☐ contained in the international application as filed.
- ☐ filed together with the international application in electronic form.
- ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2009/053551

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-21	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	1-21	YES
	Claims	NONE	NO
Industrial applicability (IA)	Claims	1-21	YES
	Claims	NONE	NO

2. Citations and explanations :

Reference is made to the following documents:

D1: US 2005-0121090 A1 (Harry A. Hunnicutt) 09 JUNE 2005
D2: US 2002-0029814 A1 (Marc Unger et al.) 14 MARCH 2002
D3: US 6123316 A (David K. Biegelsen et al.) 26 SEPTEMBER 2000

Claims 1-21 of the present invention relate to a microvalve device for controlling the supply of pressurized fluid to a load in a fluid circuit. This device has multiple internal fluid conduits for providing pressure feedback. The microvalve device comprises a body formed of multiple plates of material, a slider element, and a fluid conduit being defined in a portion of the body. Also, a microvalve device comprises a body defining a first port and a second port and a fluid flow conduit, a slider element, and multiple fluid conduits.

D1 discloses a microvalve having a generally planar plate valve body defining a chamber and a plate valve member movable in the chamber about a pivot axis that is perpendicular to the valve body to control the flow of a fluid through the valve body. The plate valve member defines a pair of opposite faces, a first duct therethrough provides fluid communication between the opposite faces to equalize fluid pressures acting on the opposite faces in the region of the first duct. The plate valve member also has a second duct therethrough that provides fluid communication between the opposite faces to equalize fluid pressures acting on the opposite faces in the region of the second duct. The first duct and the second duct are equidistant from the pivot axis.

D2 discloses a method of fabricating an elastomeric structure. This method comprises steps of: forming a first elastomeric layer on top of a first micromachined mold; forming a second elastomeric layer on top of a second micromachined mold; bonding the bottom surface of the second elastomeric layer onto a top surface of the first elastomeric layer such that a control channel forms in the second recess between the first and second elastomeric layers; and positioning the first elastomeric layer on top of a planar substrate such that a flow channel forms in the first recess between the first elastomeric layer and the planar substrate.

D3 discloses construction of fluid conduit systems in printed circuit boards or other dielectric laminate substrates. The fluid conduits can be angled or curved to provide greater directional control of fluid flow. Conduits are created by lamination of a first laminate layer and a second laminate layer. The first laminate layer is composed of a dielectric base material impregnated with a resin, with a first aperture defined therethrough, while the second laminate layer has a second aperture. The second aperture is positioned with respect to the first aperture to only partially overlap, together defining an angled conduit. Fluid flow through the conduits can be controlled using microdevice valves.

-To be continued on the supplemental box-

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2009/053551

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

(Continuation of Box No. V)

(1) Novelty and Inventive Step

The subject matter of claims 1, 13, 20 and 21 is respectively directed to a microvalve device with a body formed of multiple plates of material, a slider element, and a fluid conduit being defined in a portion of the body; a microvalve device with a body defining a first port and a second port and a fluid flow conduit, a slider element, and multiple fluid conduits; a microvalve device with a body formed of multiple plates of material, a slider element, and a trench defined in a plate of the body; and a microvalve device with a body having a fixed portion, a slider element, a first fluid conduit, and a second fluid conduit.

The subject matter of D1, D2 and D3 respectively presents a microvalve having a generally planar plate valve body defining a chamber and a plate valve member movable in the chamber about a pivot axis; a method of fabricating an elastomeric structure; and construction of fluid conduit systems in printed circuit boards or other dielectric laminate substrates.

D1-D3 differ from claims 1, 13, 20 and 21 since the prior art documents do not disclose the slider element. Furthermore, the technical feature does not seem to be obvious to a person skilled in the art by the documents listed in the international search report, taken alone or in combination.

Therefore, the subject matter of claims 1, 13, 20 and 21 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 2-12 and 14-19 depend on claims 1 and 13, respectively, and therefore meet the requirements of PCT Article 33(2) and (3).

(2) Industrial Applicability

The inventions claimed in claims 1-21 can be made and used in the industry concerned. Therefore, the subject matter of claims 1-21 is considered to be industrially applicable under PCT Article 33(4).